Active and passive immunization

Active and passive immunisation

	Active immunisation	**Passive immunisation**
Speed of response	**Delayed**	**Prompt**
Length of response	**Long-term**	**Short-term**
Clinical use	**Long-term prophylaxis**	**Treatment, short-term prophylaxis**

Passive immunization

- Substitution of missing specific antibodies protecting against infectious disease or treating the infectious disease.
- Used mainly in infectious diseases or diseases caused by toxins.
- Prompt but short-term effect.
- No immunological memory is induced.

Antisera used in human medicine

- Against bacterial infections: Tetanus (human), Diphteria (equine), Botulism (equine)
- Against viral infetions: Hepatitis B (human), Rabies (equine), Varicella-zoster (human), CMV (human), tick-born encephalitis (human), hepatitis A, measles and other viral infections (pooled human immunoglobulin)
- Against snake or black widow spider toxins
- Anti Rh

Non-specific immunoglobulin derivates

- Obtained from donors´ plasma by ethanol extraction.
- Contains almost exclusively IgG, other isotypes are present only in traces.
- Currently only derivates for intravenous or subcutaneous application are used.

Therapeutic use of immunoglobulin derivates - I

- Replacement treatment in patients with hypogammaglobulinemia .
- It is only IgG substitution, other isotypes are not present.
- In patients with primary hypogammglobulinemia it is usually a life-long treament.

Therapeutic use of immunoglobulin derivates - II

- High-dose intravenouss immunoglobulin treatment can be used in severe inflammatory or autoimmune diseases.
- The mechanism is complex (inhibition of phagocytosis, suppression of B-cells function, effete on T-cell functions) .
- The efficacy is variable and in situation difficult to predict.
- Most effective in Kawasaki disease and immune thrombocytopenic purpura (ITP).

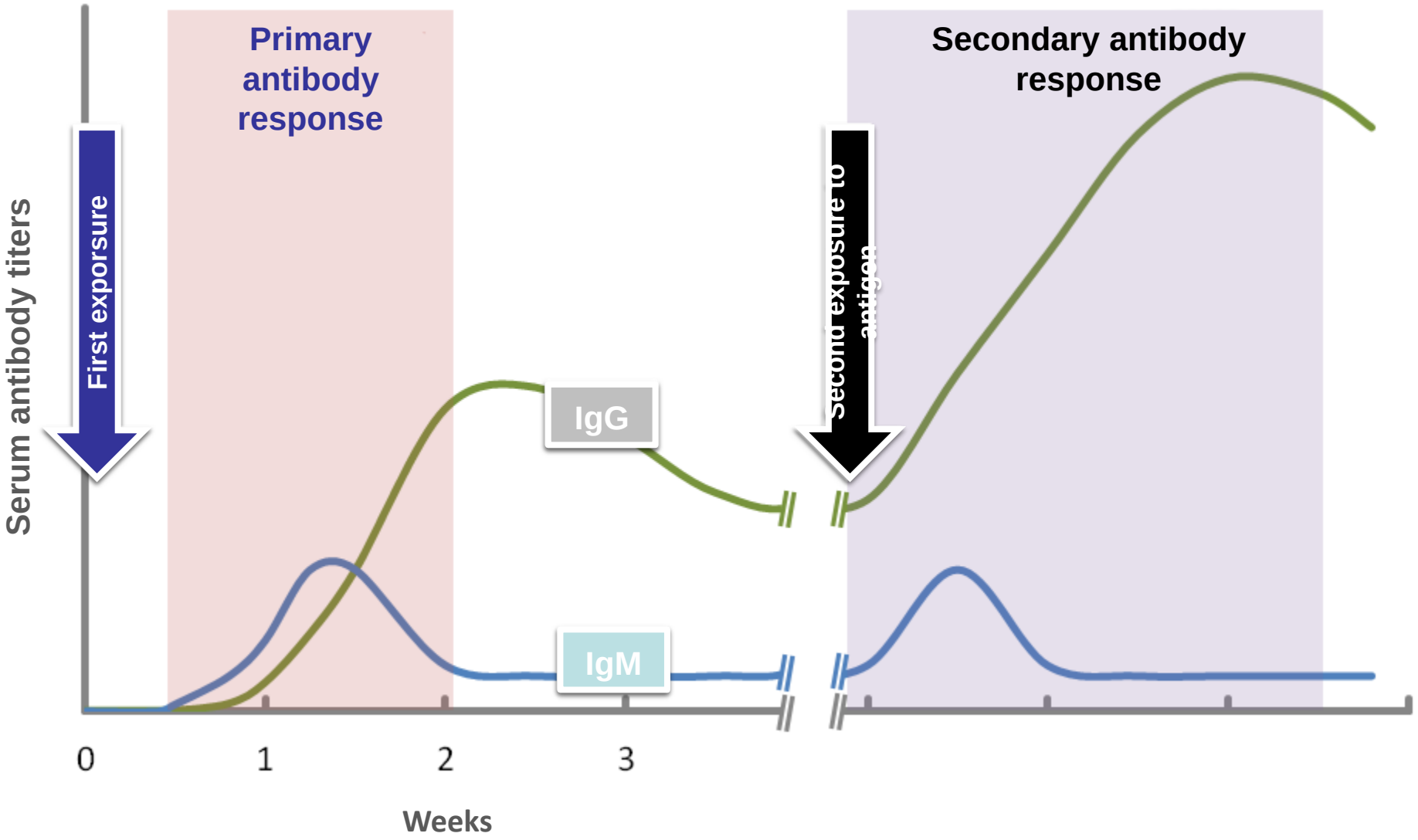
Active immunization (vaccination)

- Induction of immune memory by a harmless antigen.
- In the case of infection by a pathogen prompt secondary immune response protects the immunized person from the disease.
- Has protective, but no therapeutic effect.

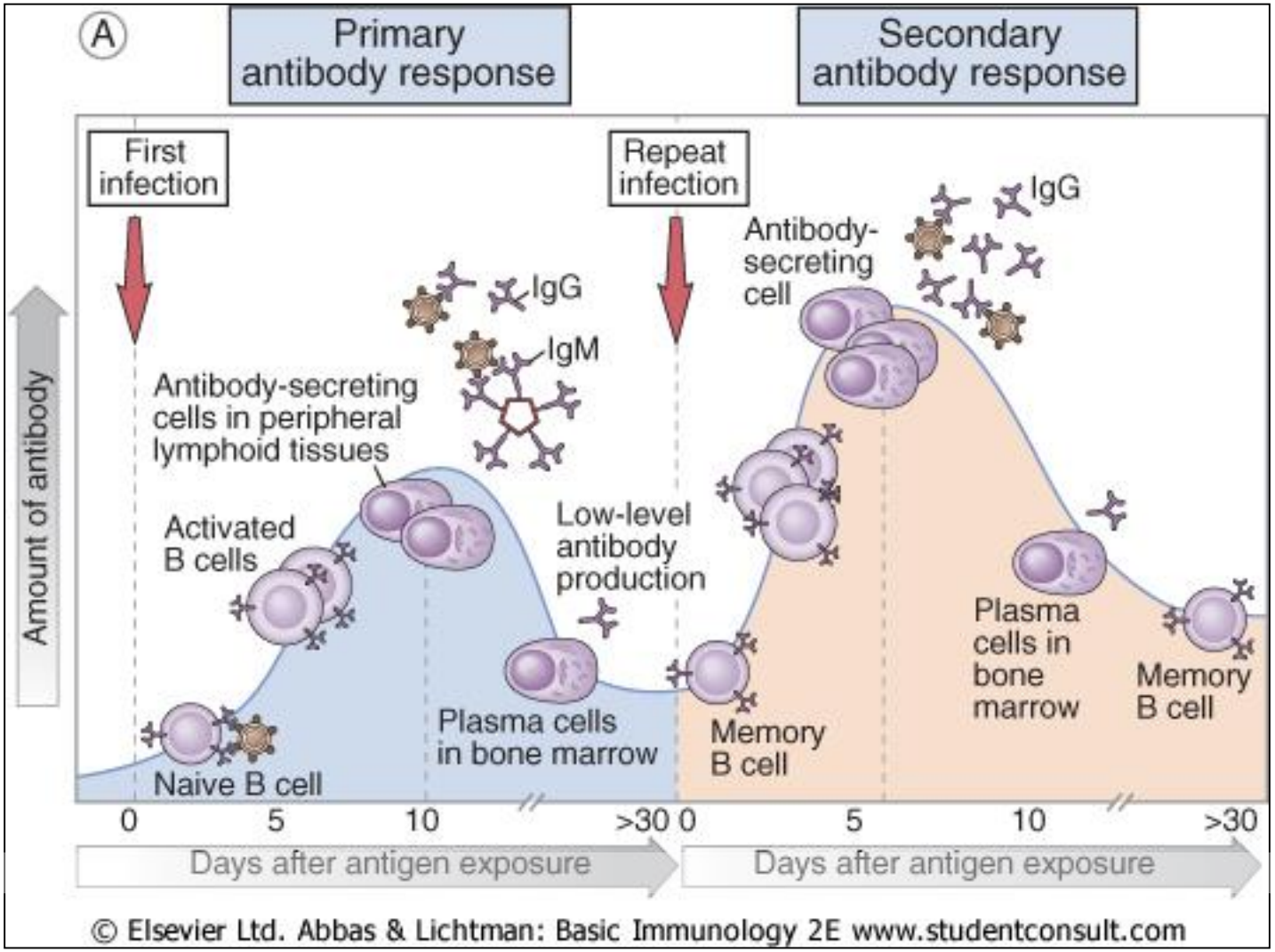
Edward Jenner

Discovery of small pox vaccine

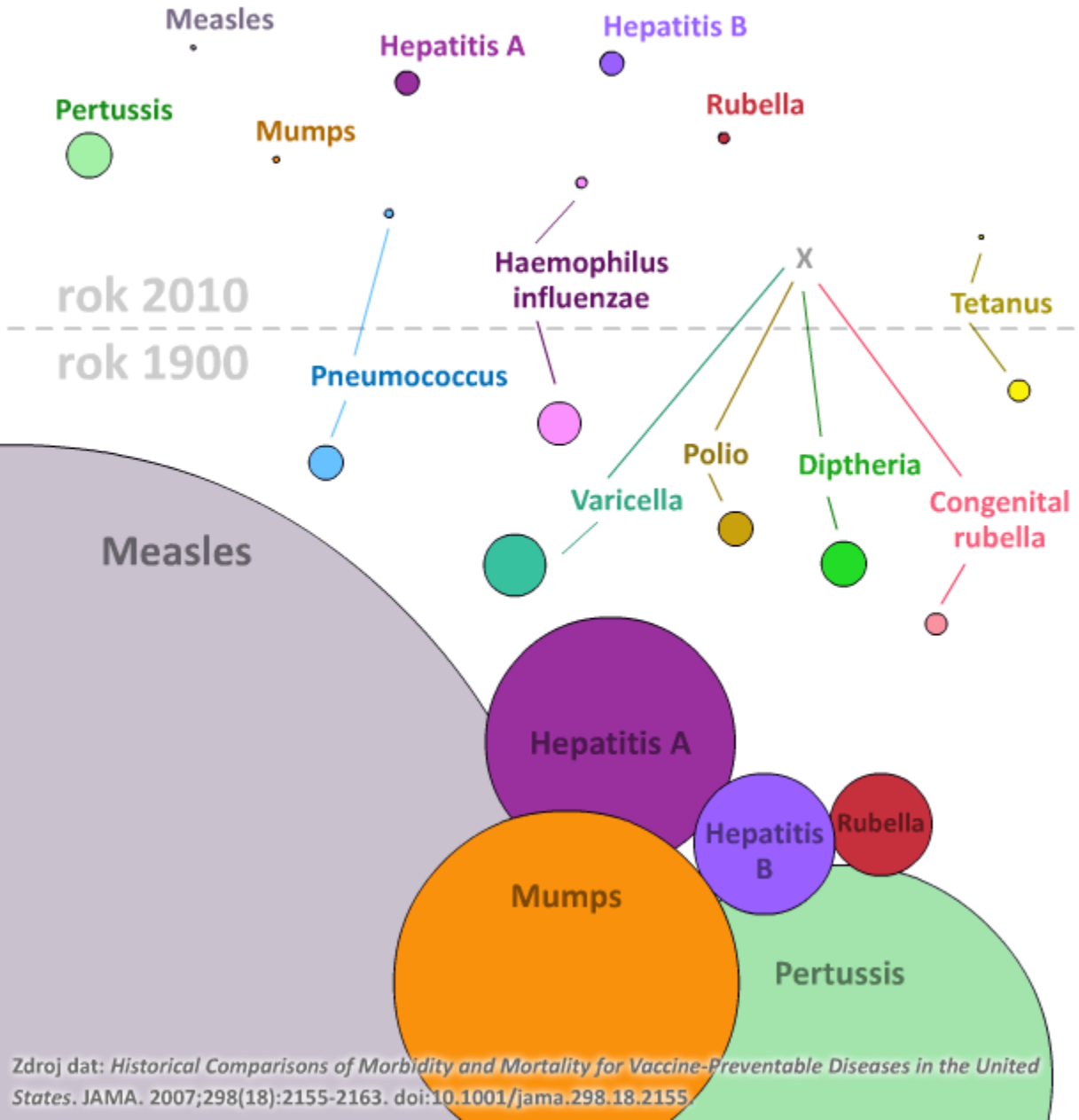
Primary and secondary immune response



Primary and secondary immune response



The effect of vaccination on infectious diseases occurrence in USA



1900:	29 005	100%	Varicella
2010:	0		
1900:	21 053	100%	Diphtheria
2010:	0		
1900:	16 316	100%	Polio (paralytic)
2010:	0		
1900:	152	100%	Congenital rubella
2010:	0		
1900:	580	99%	Tetanus
2010:	8		
1900:	530 217	99%	Measles
2010:	61		
1900:	47 745	99%	Rubella
2010:	6		
1900:	20 000	99%	Haemophilus influenzae
2010:	270		
1900:	162 344	98%	Mumps
2010:	2 528		
1900:	117 333	91%	Hepatitis A
2010:	11 049		
1900:	200 752	89%	Pertussis
2010:	21 291		
1900:	66 232	83%	Hepatitis B (acute)
2010:	11 269		
1900:	16 069	74%	Pneumococcus
2010:	4 167		<5 years of age

Zdroj dat: *Historical Comparisons of Morbidity and Mortality for Vaccine-Preventable Diseases in the United States*. JAMA. 2007;298(18):2155-2163. doi:10.1001/jama.298.18.2155

„Classical“ vaccines

- **Atenuated microbes**: mumps, measles rubella (MMR vaccine), rotavirus varicella, BCG (against TBC),cholera, yellow fever, poliomyelitis,
- **Inactivated microorganisms**: rabies, hepatitis A, tick-born encephalitis, poliomyelitis, cholera, plague. Formerly pertussis.
- **Toxoids**: tetanus, diphteria

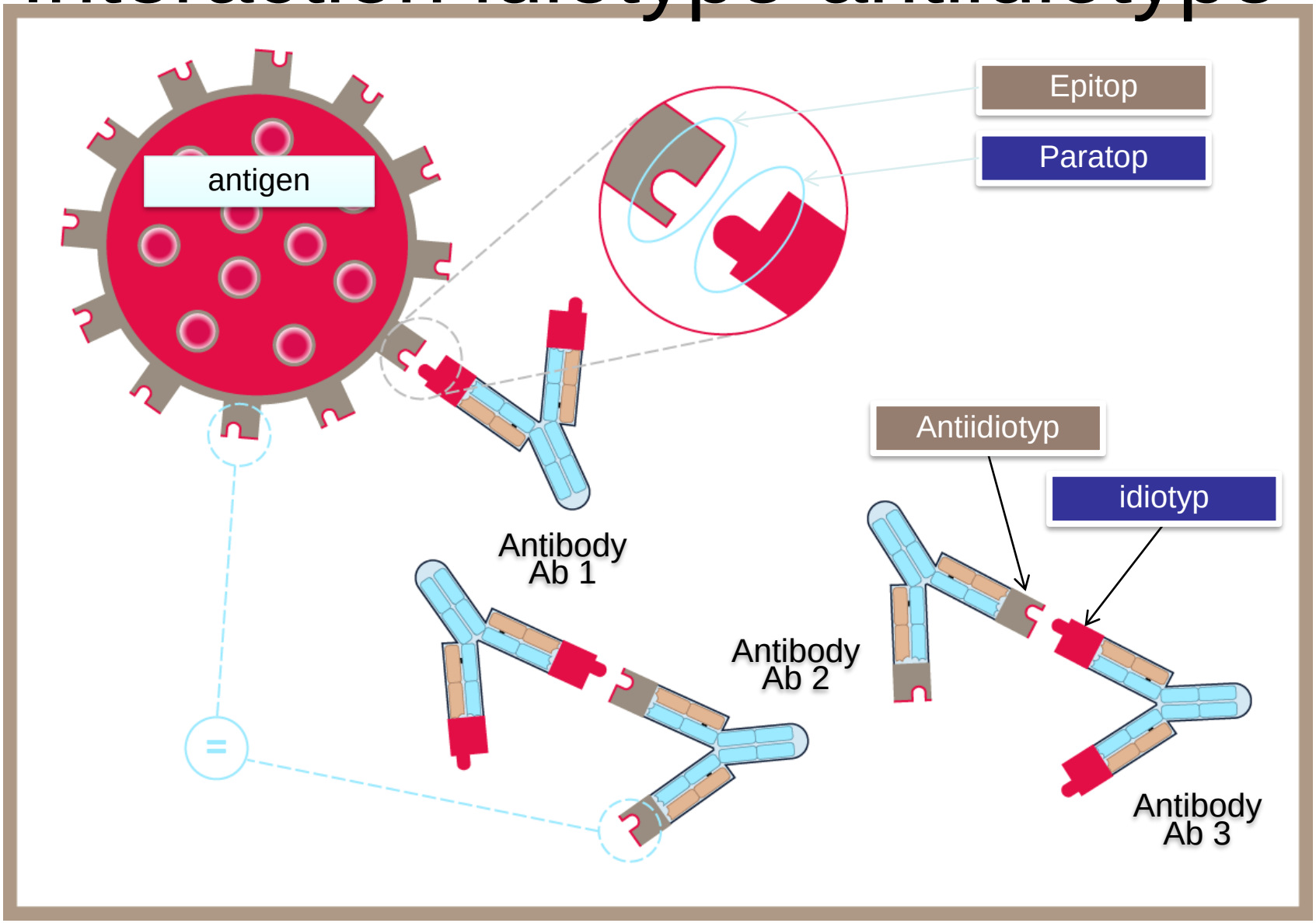
„Modern“ vaccines

- **Subunit**: influenza, pertussis
- **Polysaccharide**: Heamophilus influenzae B (conjugated), Meningococcus (conjugated group B, nonconjugated the remaining serotypes), Pneumococcus (conjugated)
- **Recombinant**: hepatitis B
- **Virus-like particles** : papillomavirus

„Future (?)“ vaccines

- Synthetic polypeptides
- Antiidiotype antibodies
- DNA vaccines
- Vector vaccines
- Antigens inserted into food (bananas, potatoes)

Interaction idiotype-antiidiotype



Other (possible) uses of vaccination approach

- Anti-tumour vaccination – both preventive to therapeutic approaches are used
- Prevention ant treatment of Alzheimer disease – anti β-amyloid or τ-protein
- Contraception – most frequently anti-HCG
- Treatment of high blood pressure – enzymes of angiotensin-renin-aldosterone system
- Vaccination against autoimmune diseases – e.g. against autoimmune TCR.
- Vaccination against drugs (cocaine)